MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

DBM5614 –MATHEMATICS

(for diploma students only)

12 MARCH 2020

2.30 pm – 4.30 pm

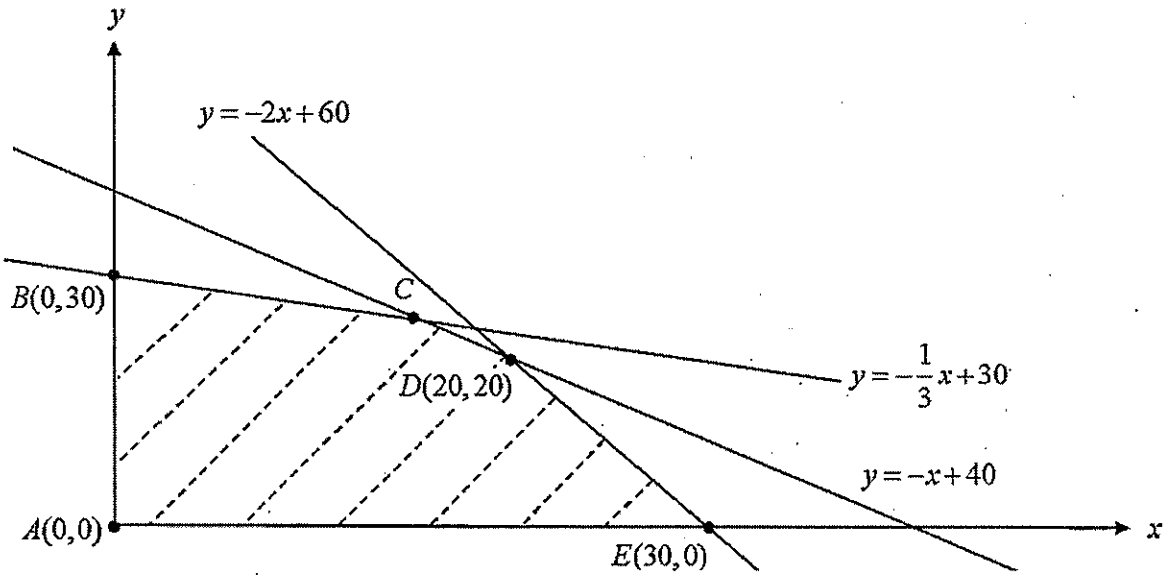
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **3** pages excluding cover page and appendix.
2. Attempt **ALL FOUR (4)** questions. The marks distribution for each question is given.
3. Write all your answers in the Answer Booklet provided.
4. Key formulae are given in the Appendix.

Question 1

a) Tudiaa Company sells x units of online agent tickets and y units of offline agent tickets. It is found that the profit for each online and offline tickets is RM900 and RM500 respectively. The following graph describes the constraints for the tickets selling.



i. List down the constraints (other than $x, y \geq 0$) obtained from the graph. (3 marks)

ii. Determine the coordinate of point C. (5 marks)

iii. From the graph, evaluate each of the corner points if given that the objective function is $P = 900x + 500y$. (5 marks)

iv. From answer in part (iv), identify the maximum profit of x units of online agent tickets and y units of offline agent tickets. (2 marks)

b) The following table shows the ingredients to produce Cheesekut Milo and Cheesekut Oreo dessert. It requires at least 35 pieces of biscuits, maximum of 20 pieces of cheese and at most 15 spoon of condensed milk.

	Cheesekut Milo (X)	Cheesekut Oreo (Y)
Biscuits	7	5
Cheese	4	2
Condensed milk	5	3

i. List the linear inequalities that satisfy the above conditions. (4 marks)

ii. Hence, determine the x and y intercepts for each condition. (6 marks)

[TOTAL: 25 MARKS]

Continued...

Question 2

a) Tania saves her money in EmBank and JunBank. EmBank pays 1.55% per annum compounded monthly and JunBank pays 1.25% per annum compounded quarterly.

i. Find the effective rate of each bank. (4 marks)
ii. Identify which bank offers a better return to her. (1 mark)

b) Szaki is considering buying a car. He managed to shortlisted his car preferences from motortrader.com as shown in the following table.

	New Car	**Used Car**
Model	Honda City 1.5 i-VTEC	Honda City 1.5A
Selling price	RM65800	RM49800
Registered year	2019	2017
Bank	Bank Islam	RHB Bank
Loan period	9 years	5 years
Interest rate	3.05%	5.50%
Type of interest	Simple interest	Compounded monthly

i. Based on the table above, calculate the loan amount for both cars if 10% deposit is charged from the selling price. (4 marks)
ii. Compute the interest charged by Bank Islam with simple interest rate. (2 marks)
iii. Hence, how much Zach needs to pay Bank Islam in total? (1 mark)
iv. From answer in part (iii), calculate the monthly payment for new car. (2 marks)
v. Find the monthly payment for used car. (5 marks)
vi. Which car pays less monthly payment? (1 mark)

c) Calculate the future value of the annuity of RM800 per month for 6 years with interest paid monthly at an annual rate of 2.75%. (5 marks)

[TOTAL: 25 MARKS]

Question 3

a) Given $y = 1991 + \frac{\ln x}{1991} + 1991e^{x} - 1991x + 1991\pi$.

i. Find y'. (5 marks)
ii. From answer in part (i), find y''. (3 marks)

b) Use **Product Rule** to differentiate $f(x) = \left(3x^3 - 1\right)\left(9 + 2x^5\right)$. (6 marks)

Continued...

c) Given a function $y = \frac{1}{\left(7+9x^2\right)^{2020}}$.

i. Find $\frac{dy}{dx}$ by using **Chain Rule.** (7 marks)

ii. From answer in part (i), identify the value of p and q if $\frac{dy}{dx} = \frac{px}{\left(7+9x^2\right)^q}$. (2 marks)

d) Evaluate the marginal revenue function, $\frac{dr}{dq} = 20.20q^2 - 20\sqrt{q}$ when $q = 100$. (2 marks)

[TOTAL: 25 MARKS]

Question 4

a) Evaluate the indefinite integral of $\int\left(\frac{4}{5}e^x + \frac{4}{5x} - 5x^4 - \sqrt{45}\right)dx$. (5 marks)

b) Given that $\int 9x\left(9x^2 - 2020\right)^9 dx$.

i. If $u = 9x^2 - 2020$, find $\frac{du}{dx}$. (1 mark)

ii. Hence, evaluate $\int 9x\left(9x^2 - 2020\right)^9 dx$ by using the **Substitution Rule.** (6 marks)

c) Given that $\int_2^4 f(x)dx = 20$. Determine the value of m if $\int_2^4 f(x)\,dx + \int_0^7 m\,dx = 55$. (7 marks)

d) It is found that marginal-cost function for a company that produces q units of jackets is $\frac{dc}{dq} = 2.5q^3 + 20q$.

i. Determine the total-cost function, $c(q)$. (3 marks)

ii. Hence, calculate the total cost from 20 to 30 units. (3 marks)

[TOTAL: 25 MARKS]

End of Paper.

APPENDIX – FORMULAE

Effective Rate	
$r_e = \left(1+\frac{r}{n}\right)^n - 1$	
Simple Interest $I = Prt$	**Future Value** $FV = PV\left(1+\frac{r}{n}\right)^{n\times t}$
Present Value Annuity $A = R\left[\frac{1-\left(1+\frac{r}{n}\right)^{-n\times t}}{\frac{r}{n}}\right]$	**Future Value Annuity** $S = R\left[\frac{\left(1+\frac{r}{n}\right)^{n\times t}-1}{\frac{r}{n}}\right]$

Derivatives

1. $\frac{d}{dx}\left(ax^n\right) = anx^{n-1}$	2. $\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1}\cdot g'(x)$
3. $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x)+g(x)f'(x)$	4. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$

Logarithmic Functions	Exponential Functions	Chain Rule
$\frac{d}{dx}(\ln x) = \frac{1}{x}$	$\frac{d}{dx}\left(e^x\right) = e^x$	$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx}$
$\frac{d}{dx}\ln u = \frac{1}{u}\cdot\frac{du}{dx}$	$\frac{d}{dx}e^u = e^u\frac{du}{dx}$	

Integration

1. $\int k dx = kx + C$	2. $\int ax^n dx = \frac{ax^{n+1}}{n+1} + C, \quad n \neq -1$
3. $\int e^x dx = e^x + C$	4. $\int \frac{1}{x} dx = \ln x + C$
Definite Integral, $A = \int_a^b f(x)\,dx = F(b) - F(a)$	